THE CRANE CORNER

NAVAL FACILITIES ENGINEERING COMMAND

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A WORD FROM TOPSIDE

As we begin the New Year, I would like to pause briefly to review the Navy shore weight handling program. With the Navy Crane Center (NCC) FY00 annual report fresh in my mind, I want to discuss Navy weight handling trends and some of the actions in progress to positively influence the performance of the overall Navy weight handling program.

ACCIDENTS

The number of accidents reported in FY00 decreased from the previous year. The number of WHE accidents was 251 in FY00 as compared to 305 in FY99. We continue to emphasize weight handling safety awareness with our quarterly accident lessons learned naval messages and our "Crane Corner" publication. In addition, we distributed to all Navy shore activities a set of seven crane accident prevention videos to raise the level of safety awareness. We urge all activity commanding officers to make the goal of zero accidents a strong command focus.

AUDITS

In our audit program, we completed 138 audits in FY00. We saw a significant reduction in the number of unsatisfactory cranes for the first time. After two years of a nearly 50 percent unsatisfactory crane rate, the rate in FY00 dropped to 37 percent. (See *FY00 Audit Summary* article.)

NAVFAC P-307

We published the 2000 edition of NAVFAC P-307 in September. It includes changes that provide opportunities for cost avoidance without sacrificing safety or reliability. One of the big changes, as a result of an OSHA rule clarification, is the deletion of the requirement for NCC ("third party") certification of longshoring cranes that only handle ships' stores.

FLOATING CRANES

We continued our aggressive management of the Navy's floating cranes, facilitating the transfer of five cranes to activities that had an immediate need for them. Four underutilized floating cranes were reassigned. This resulted in potential future cost avoidance of four new cranes, about $50 million, and significant enhancement of the safety of the program by removing from service four accident-prone, difficult-to-operate floating cranes. We provided hands-on training in brake setup and maintenance of 60-ton Dravo floating cranes and endorsed the qualification of every operator of these cranes. These initiatives will go a long way toward ensuring the safe operation of these cranes.

TRAINING

In October 1999, we initiated our training program for mechanics, electricians, inspectors, test directors, riggers, and operators of Navy cranes. During the fiscal year, NCC, in conjunction with shipyard instructors, provided 210 training classes for 3,500 weight handling support personnel. The Naval Construction Training Centers are training Seabees using the same lesson plans.

FIELD SUPPORT

Our In-Service Engineering Division had a busy year, reviewing a record number of crane alteration requests. In addition, the entire Field Support Team continued to provide WHE assistance in response to emergent situations and to requests for help both within and external to the Navy.

ACQUISITION

We delivered five cranes to the Navy shore community including the Navy's first container cranes. The container cranes enhance the Navy's ability to handle containerized cargo. We placed our first two sets of multiple award indefinite delivery/indefinite quantity contracts for cranes. (See *Crane Acquisition* article.) By using the multiple award contract format, we can reduce the time it takes to buy a crane, develop a cadre of manufacturers who understand our requirements, and be more responsive to our clients' needs. In addition, we contracted for the delivery of 23 cranes and for the overhaul/restoration of 3 cranes.

INFORMATION TECHNOLOGY

We implemented paperless acquisition procedures. By the end of FY00, we achieved an annual average rate of 76 percent for paperless transactions processed. Our goal is 100 percent. To aggressively pursue this goal, we will incorporate a requirement for paperless submissions in all our future contracts.

We continued to emphasize the use of information technology to provide information to our clients. Improvements to our Internet site include adding the September 2000 NAVFAC P-307, adding the Audit Summary report, and adding the list of mandatory and standing Crane Alterations. We have also created an Intranet site for our employees to share information and resources. 

HAVE YOU HEARD ABOUT?

A simple two-part patented locking device is available for mounting components onto shafts from 1/8 to 1/2 inch diameters. The only tools required for installation are two wrenches. The device takes up little space radially - for 1/8-inch shaft diameter, its outside diameter is 1/4 inch; and for ½-inch shaft diameter, its outside diameter is 3/4 inch. Axially, the device extends 1/4 inch to 7/16 inch from the hub face for the above shaft diameters. This device is suitable for applications on low torque transmitting mechanisms that may require repositioning of components or fine adjustment, such as limit switch connections.

According to the manufacturer, the device:

- Eliminates keys, keyseats, and setscrews.
- Installs and repositions in seconds.
- Self-centers.
- Requires no precise diameter matching.
- Can be installed over existing keyseats.
- Does not mar the shaft.

Due to the unique thread geometry of its inner and outer sleeves, the device produces an extremely high radial clamping force when tightened. Both sleeves are made of AISI 416 stainless steel. ■

CRANE ACQUISITION
(INDEFINITE QUANTITY CONTRACTS)

On 19 September 2000, we placed our second group of multiple award indefinite delivery/indefinite quantity contracts; this time for standard commercial overhead electric traveling (OET) cranes. (On 3 April 2000, we placed our first multiple award indefinite delivery/indefinite quantity contracts for specialized OET cranes as reported in the June 2000 *Crane Corner*.) These contracts are for a three-year period with one two-year option.

The first order was for a 10-ton OET crane.

For all future specialized and standard commercial OET requirements, only the contractors awarded the indefinite delivery/indefinite quantity contracts will be permitted to participate in the competition. There will be no need for a lengthy evaluation process. Therefore, we will be able to meet urgent as well as planned requirements in a much more expedient way.

We feel that by using the multiple award contract format we can reduce the time it takes to buy a crane, develop a cadre of manufacturers who understand our requirements, reduce the time it takes to manufacture and deliver a crane, and be more responsive to our clients' needs. ■

FOURTH QUARTER FY00
CRANE ACCIDENT REPORT

The Navy Crane Center (NCC) disseminates crane accident lessons learned to prevent repeat accidents and improve overall crane safety. NAVFAC P-307 requires commands to submit a final, complete accident report (including corrective/preventive actions) to NCC within 30 days regardless of severity or type. In addition, contracting officers are required to forward reports of contractor crane accidents to NCC within 30 days. In the fourth quarter of FY00, Navy shore activities reported 51 crane accidents and 1 contractor crane accident. Serious accidents included 2 personal injuries, 4 dropped loads, 3 overloads, and 3 two-blockings.

PERSONAL INJURIES

- A category 2 bridge crane was moving a 400-pound load using a four-leg chain sling, when one of the two unused legs slid off the load. This caused the sling hook to strike the rigger on the forehead, resulting in the rigger requiring medical treatment.

- A mobile crane was lifting a load of approximately 600 pounds when the below the hook lifting device got lodged between two structures, causing the sling to be overloaded and part. When the sling parted, a portion of the sling struck one of the crane team members causing an injury to his hand.

LESSONS LEARNED

- During any crane operation, proper selection of rigging equipment is critical. If a two-leg sling is required to safely and successfully complete a crane lifting evolution, then that gear should be selected and used. In the event that this cannot be accomplished, all unused sling legs must be secured to prevent any unanticipated movement.

- Prior to lifting any load, WHE personnel must always verify that there are no obstructions in the load's path.

DROPPED LOADS

- A mobile crane was hoisting a load weighing approximately 150 pounds as it was simultaneously being guided through a doorway when it collided with the doorway frame. This caused the load to dislodge and fall to the pier.

- Two bridge cranes were lifting (complex lift) a load that weighed approximately 24,000 pounds when the load slid out of the rigging gear. The load had no lifting pads and the chain slings were in a basket hitch configuration. A choker hitch configuration would have restrained the load and prevented it from falling.

- A mobile crane was hoisting a test load weighing 111,140 pounds when the test weights shifted and collided with the crane tires causing two of the test weights (5,000 pounds) to fall approximately 5 feet to the pier.

- A mobile crane was lifting a mobile power unit weighing 5,900 pounds when a tie-down ring pulled out allowing the load to shift. This caused the mobile power unit battery to fall approximately 35 feet to the pier.

LESSONS LEARNED

- Prior to any hoisting operation the crane team must verify that the load is properly secured.

- Prior to any lift, rigging personnel should review rigging configurations and assess the pros and cons of their selected rigging arrangements. Loads must be secured in a manner that will prevent the load from becoming dislodged if the load happens to shift during the lifting operation.

OVERLOADS

- A 15,000-pound capacity bridge crane was overloaded when one hold down bolt was not removed prior to hoisting a load weighing 3,500 pounds. In addition, the load and two nylon slings were damaged.

- A mobile crane was overloaded while conducting a load test when the test load (10,100 pounds) was miscalculated. The weight of the hook block and two parts of line were not subtracted from the allowable load.

- A category 3 jib crane with a capacity of 2,000 pounds was overloaded when an unmarked load weighing 2,115 pounds was hoisted.

LESSONS LEARNED

- Riggers must verify that all fasteners that attach a load to its supporting foundation are removed prior to hoisting the load.

- The test director must ensure that all proper deductions noted on the original equipment manufacturer's load chart are taken into account when calculating the weight of the test load.

- The crane team must verify the weight of the load prior to hoisting.

TWO-BLOCKING

- A mobile crane was two-blocked during a load test when the crane operator inadvertently placed the crane's auxiliary hoist control (joystick) in the wrong position.

- While lifting a load weighing 60 pounds, a category 4 crane was two-blocked when the operator misjudged the hook block clearance when he extended the boom.

- During performance of the crane operator's monthly checklist inspection, the operator two-blocked a bridge crane. During this inspection, the operator of the pendant controls noticed that the controls were reversed due to a phase reversal, but he continued to operate the crane.

LESSONS LEARNED

- The operator must stop the operation when any load bearing or load controlling discrepancies are found. These discrepancies shall be reported and repaired prior to crane operation.

- Operators need to be especially alert whenever the hook block is near a two-blocking condition.

CONTRACTOR ACCIDENT

- A mobile crane was lifting a load weighing approximately 42,000 pounds when the below the hook lifting device failed, damaging the crane boom. This caused the crane to be removed from service. The accident investigation found that the below the hook lifting device was not constructed in accordance with the assembly's original design.

Serious crane accidents are still occurring and human error (e.g. inattention to detail) is the primary factor. Weight handling program managers and safety officials are encouraged to consider the potential risk of accidents similar to those highlighted above occurring at your activity and apply the lessons learned to prevent

similar accidents. OPNAVINST 3500.39, *Operational Risk Management*, prescribes methods for assessing hazards and controlling and minimizing risks in hazardous operations. Activities should incorporate these principles into both training and day-to-day weight handling operations.

Contracting officers are again reminded to ensure that contractors report all serious weight handling equipment accidents that occur on Navy property per paragraph 1.7.2 of NAVFAC P-307.

P-307 … QUESTIONS AND INTERPRETATIONS

The following questions on NAVFAC P-307 have been answered recently and are printed below for your information.

Question: Ordnance Handler Training. After October 2001, can ordnance handlers that have not had the training classes required by NAVFAC P-307 act as the riggers in charge (the only rigger) on pre-engineered ordnance lifts as long as they meet the personnel qualification requirements of appendix N?

Answer: The following training requirements apply:

September 2000 NAVFAC P-307, section 13, training and qualification paragraph 13.1 contains the following requirements: "Ordnance handlers shall refer to NAVSEA OP-5 for training requirements, in lieu of the crane rigging and rigging gear inspection courses noted herein."

Advance notification of changes to the NAVSEA OP-5 (revision expected in January 2001) includes qualification requirements for crane operators and ground/deck personnel who assist in ordnance crane operations. Specifically, section 10-6 will require that "... ground/deck personnel (will) have been trained in communications according to section 10.6 of NAVFAC P-307." NAVSEA OP-5, paragraph 10-6.2, D-3.1, will require that "... each CO/OIC ensure that one person within their command complete the Navy Crane Center course titled "Crane Rigger" and that person be assigned appropriate review authority within the activity's SOP approval process for all SOP's that require the use of WHE ..."

Question: Integral Lifting Attachments. NAVFAC P-307, paragraph 14.1.1, exempts original equipment manufacturer's (OEM) installed integral lifting attachments from marking or certification. Our activity encounters pumps, motors, and various other equipment, which are designed by the OEM to be lifted with eyebolts or safety hoist rings (SHR). In some cases, the OEM permanently installs the eyebolts or SHR's by welding or staking the threads to prevent removal. In other cases, the OEM provides eyebolts or SHR's to lift an item, but they are easily removable (either installed in the equipment, or shipped in the same container as the equipment, but not yet installed in the lifting holes). P-307 provides no definition of an OEM installed integral lifting attachment.

Request that OEM installed integral lifting attachments be defined as "Attachments, which are fabricated or formed (welded, cast, molded, or threaded) as integral parts for lifting the component or equipment." Clarify if it is necessary to unthread (when possible) the installed lifting attachment for visual inspection prior to use. Clarify if OEM provided eyebolts or SHR's, designed to lift the equipment and shipped with the equipment but not yet installed, must be marked and certified per P-307. These eyebolts or SHR's may only be required for several lifts (i.e., lifting the object from a contractor's truck to a lay down area, lifting for placement shipboard, and subsequent removal upon completion of an availability). Testing, marking, and certification of these lifting attachments are not economically feasible, and some contractors do not allow overload testing of their gear.

Clarify if OEM installed lifting attachments (eyebolts, SHR's, etc.) installed in shipboard or facility motors, pumps, etc. that are not welded, staked in place, or otherwise permanently installed, require certification per P-307.

Answer: NAVFAC P-307 defines OEM integral lifting attachments as "Lifting attachments that are fabricated or formed (welded, cast, or molded) as integral parts of (i.e., permanently attached to) the component or equipment to be lifting. Internal threads in tapped holed are considered integral lifting attachments."

P-307, paragraph 14.1.1 excludes OEM integral lifting attachments and OEM provided rigging gear used for limited lifts (e.g., offload, initial storage, reloading, and shipment) of that OEM's product. However, if the OEM provided rigging gear is utilized for general rigging and handling, compliance with P-307, section 14 is required.

Question: Observing Complex Lifts. Can a qualified operator supervisor or designated alternate (e.g., work leader) observe complex lift on-site conditions and conduct pre-lift meetings in place of a rigging supervisor?

Answer: September 2000 NAVFAC P-307, paragraph 10.4.1.1, requires a rigging supervisor or crane operator supervisor to review the on-site conditions for complex lifts and perform the pre-job briefing.

Designated alternatives such as work leaders are not allowed to perform these functions. However, if the complex lift is repetitive in nature, after the supervisor has been present for the first evolution of the lift with each rigging crew, subsequent identical lifts by the same crew may be done under the guidance of the rigger-in-charge.

CONTRACTOR CRANE UNSAFE PRACTICES

Recently, a team from a naval shipyard working at another naval facility rented a 35-ton mobile hydraulic truck crane (administratively rated at 14.5 tons) with a contractor operator to perform work. The crane was rented by Government credit card and entered the base to perform work without knowledge of the activity. No ground load study was performed for the crane's work site.

The plan was to set the crane up outside a roll-up door of a building and to hopscotch a platform into the building, to its foundation. The 6,500-pound platform was lifted over the rear of the crane with two riggers steadying the load. The platform was positioned approximately 6 inches from the ground as the crane operator extended the boom. The platform unexpectedly contacted the ground and bounced up 6 inches. At this time, the crane operator lowered the hoist, and set the platform on the ground. When the crane operator attempted to lift the platform again, the load did not lift, and the front outriggers were observed coming off the ground. Crane operations were not stopped and the crane was not removed from service.

The team management was notified of the incident. The shipyard's Lifting and Handling Department was notified of the possible crane accident. An accident investigation was initiated.

The rental crane contractor technical service representative informed the activity accident investigator that the crane was not overloaded and they failed to recognize the situation as a crane accident. He further explained that the load was kept close to the floor so that in the event of tipping, the load would settle to the floor. The impression given by the rental crane contractor technical representative was that tipping a crane is common practice. This erroneous philosophy can be passed on from management to the crane operator. The crane was equipped with a load moment indicator and the 85% warning light was flashing, indicating a possible overload but the operator ignored it.

During a follow-up phone conversation with the rental crane contractor, the technical service representative further stated the following (many of which violate our NAVFAC P-307 requirements):

- Tipping of mobile cranes is not considered an overload condition for the crane.
- Tipping of the crane is a common practice used to determine the maximum lift/radius.
- The load moment indicator is set for the maximum capacity of the crane and not the reduced/administrative capacity.
- The contractor has a pre-approved pass for access to the facility, and routinely enters the facility without the activity's knowledge.
- The contractor works on this and other Navy facilities in the area frequently and currently has a 70-ton capacity crane working at a pier.
- The subject crane was still in service on another job.

Numerous requirements of NAVFAC P-307 paragraph 1.7.2 and safe crane operating practices were violated. All Navy activities should be concerned with contractor cranes that may be operated in an unsafe manner. The requirements of NAVFAC P-307 apply to all contractor cranes entering and operating on Navy property.

THIRD PARTY CERTIFICATION FOR CARGO TRANSFER

Due to a recent change to the OSHA standard for Marine Terminals (29 CFR 1917), which is the standard applicable to shore based cranes involved in cargo handling operations, cranes that only transfer ship's stores no longer require third party certification. This change is reflected in the September 2000 edition of NAVFAC P-307. The only Navy cranes now requiring Navy Crane Center (NCC) certification are floating cranes engaged in shipbuilding, ship repair, and ship breaking operations, and all types of cranes engaged in cargo transfer. Privately owned cranes engaged in these operations require third party certification by an OSHA accredited agency. This requirement applies to cranes at Navy activities in the United States and its territories.

We define ship's stores as "Materials and equipment intended for the use and consumption by a ship in carrying out its mission." Cargo is defined as "Any materials or equipment intended for transport to other ships or shore activities." And cargo transfer is defined as "The loading, unloading, moving, or handling of cargo into, in, on, or out of any vessel."

Some of the Navy ships that carry cargo include ammunitions ships (AE), fast combat support ships (AOE), submarine tenders (AS), and large deck amphibious ships (LHA, LPD, LHD). Ammunition and explosives (A&E) are loaded as cargo aboard ammunition ships, fast combat support ships, and submarine tenders. Any equipment for the Marines loaded aboard amphibious ships, including A&E, is considered cargo. Other examples of cargo transfer include loading/off loading commercial cargo ships and loading/off loading material and equipment on barges for transport to other activities.

The change to the OSHA standard significantly reduces the number of Navy cranes requiring NCC certification. However, activities need to ensure cranes that handle cargo, as defined above, as well as floating cranes, including mobile cranes mounted on barges, involved in shipbuilding, ship repair, and ship breaking operations are properly certified.

FY00 AUDIT SUMMARY

During FY00, Navy Crane Center audit teams completed 138 WHE program audits, in accordance with our mission as assigned by SECNAVINST 11260.2, *Navy Weight Handling Program for Shore Activities* of 10 September 1997. Our responsibilities include auditing all activity WHE programs annually or biennially as appropriate and suspending unsafe crane operations, if necessary, at any activity. FY00 completed the initial cycle of audits (including 28 first time audits) of all shore activities with identified WHE programs.

This year's audit findings and summary data indicate significant program improvement, primarily (with a few exceptions) by activities audited two or more times. Findings at activities audited for the first time continued to exhibit fundamental deficiencies and a much lower level of compliance. For those few repeat audited activities that have failed to improve, additional claimant intervention may be required. As a result of completion of the audit cycle and the first year of the FY00 implementation of the expanded Navy Crane Center training program, all activities have an increased awareness of program requirements. However, additional effort is still required to ensure completion of training requirements during FY01 and consistent program execution to attain and maintain full compliance with NAVFAC P-307.

EQUIPMENT CONDITION

In FY00, the audit teams sample inspected/load tested 590 cranes out of a total inventory of 7,462 for the activities visited. Of all cranes sampled, 37 percent were unsatisfactory. (By contrast, in FY99, 47 percent overall were unsatisfactory.) Activities audited for the first time had a failure rate much higher (53 percent) than that of activities previously audited (36 percent).

As in FY99, brake/clutch deficiencies continued to be the most prevalent unsatisfactory condition the audit teams found, accounting for 41 percent of all deficient conditions resulting in unsatisfactory cranes. Most of the brake/clutch deficiencies were due to settings out of approved specifications. Thirteen percent were due to mechanical deficiencies and inoperative brakes. Examples were brake making excessive noise, foreign material found between mechanical brake discs, excessive drift, brake would not hold load, brake not opening, shoes misaligned, inoperative brakes, hardware missing, stuck in open position.

Load test related deficiencies were the next largest category of unsatisfactory cranes. Incorrect test procedures accounted for 15 percent. Examples were test directors not following NAVFAC P-307 appendix E test procedures, mobile cranes not tested in all applicable configurations, mechanical load brakes not tested. In addition, four percent of the audit sample cranes failed the load tests. Deficiencies included hydraulic mobile crane boom with excessive side deflection, the crane would not lift load, and the load brake failed during test.

Various mechanical component deficiencies (11 percent), wire rope deficiencies (9 percent), and deficient limit switches (9 percent) were the other common significant reasons for unsatisfactory cranes.

Other deficiencies of consequence found during crane inspections included cracks in the mobile crane carrier frame, excessive hydraulic crane boom wear pad clearance, improperly rated fuse installed in control circuits, and incorrect monorail wheel flange clearance.

PROGRAM COMPLIANCE

WHE programs complied with NAVFAC P-307 standards to varying degrees. Significant common findings are listed below. Many were found at activities audited for the first time.

CRANE SAFETY/ACCIDENTS

- Accidents not reported to Navy Crane Center.
- Investigations not thorough.

ENGINEERING

- Changes made without alteration development.
- Alterations were locally approved that should have been Navy Crane Center approved.
- Locally approved alterations not submitted to Navy Crane Center for information.
- Repair of equipment deferred without justification.

PROGRAM MANAGEMENT

- No tracking system for Crane Safety Advisories.
- Local WHE program instructions not developed or not compatible with new NAVFAC P-307 requirements.
- Adverse weather conditions notices not developed or not posted in operator's cab.
- No enforcement of the control/surveillance of contractor cranes.
- Lockout/tagout system deficiencies.
- Mobile crane limit switch bypass keys control instructions not posted in crane cab.
- Certifying officials, inspectors, test directors, and licensing officials not designated.

INSPECTION AND CERTIFICATION

- Brake specification sheets not completed.
- Test directors not following NAVFAC P-307, appendix E test procedures.
- Incorrect test paragraph numbers shown on load test certification form/missing test paragraphs.
- Mobile cranes not tested in all applicable configurations.
- Cranes tested with incorrect test load.
- Crane condition inspection report and maintenance inspection specification reports not filled out correctly.
- Elevated bridge crane rails not certified per NAVFACINST 11230.1.
- Incorrect NDT method used for crane hooks.
- Hook NDT personnel not qualified.
- Mechanical load brakes not tested.
- Specification data sheets not developed for specific cranes.
- Repair documents do not adequately describe the work done.

CRANE OPERATIONS

- Category 3 crane operators lack training.
- Unlicensed crane operators.
- Operator license files lack essential documentation.
- Operator's Daily Checklists (ODCL) not filled out properly.
- Complex lifts not identified/handled as such.
- Letters of designation for operator licensing/testing not issued.

RIGGING

- Deficient gear in service.
- Inadequate rigger training.
- Unsafe rigging practices, improper use, mismatched rigging gear.
- Gear not properly tested per NAVFAC P-307.
- Gear not properly marked per NAVFAC P-307.
- Slings tested at wrong test load percentage.

DEFICIENT CONDITIONS ON CRANES INSPECTED
(CATEGORIZED MOST TO LEAST)

1. Brakes/clutches out of adjustment.
2. Test procedures - not all components tested (e.g., mechanical load brakes), incorrect test load, mobile cranes not tested in all configurations required by P-307.
3. Deficiencies to brake/clutch (brakes making excessive noise, foreign material found between discs, excessive drift, brake would not hold, brake not opening, shoes misaligned, inoperative brakes, hardware missing, brake stuck in open position.)
4. Mechanical miscellaneous (monorail wheel flange clearance incorrect, gear loose and moving on shaft).
5. Wire rope (deficient/damaged wire rope, improper clips/clips incorrectly installed, not reeved properly, speltered end connection not proper).
6. Limit switches (inoperable, not tested)
7. Corrosion/miscellaneous structural (boom stiffener corroded, cracks in carrier frames, cracked outrigger pad).
8. Boom/corrosion/damage (excessive deflection, worn wear pads)
9. Loose wires/miscellaneous electrical (incorrect/oversized fuses, festoon cable bare wires)
10. Structural bolts (loose, missing)
11. Failed load test.
12. Hydraulic leaks (boom extension settlement, excessive leakage).
13. Unauthorized alterations (not documented/identified, local alt not forwarded to the Navy Crane Center).
14. Controls (hoist drift after release of control lever, controller stuck in travel position after release)
15. Mechanical bolts (loose, missing,)
16. Documentation (missing, not filled out properly, incomplete).
17. Blocks/hooks (painted hooks, hook nut not direct OEM replacement, spread latches, gouges in hook)
18. Load moment indicators (not tested, inoperable, out of calibration).
19. Gear cases (not inspected, excessive noise/wear, not aligned).
20. Sheaves (wear, noise, not lubricated, wire rope not seated properly, frozen equalizer sheave

ELECTRONIC CRANE HISTORY FILES

Recently, a naval activity visited the Navy Crane Center (NCC) and briefed us on their electronic filing system for their weight handling program. All of the data required by NAVFAC P-307 as well as copies of designation letters, OSHA references, crane rail certifications, audit documentation, and even P-307 itself are filed electronically. These records are instantly accessible by the commanding officer, the certifying official, and anyone in the command.

Some of the benefits the activity expects include the following:

- The documentation required by P-307 is filed in an orderly manner and indexed for ease of access.
- They can be purged easily with only the latest required information kept in the active file. Purged information can be stored on floppy discs or CD's for future reference if needed.
- The files can easily include photos.
- Back up files can be easily and quickly generated and require a minimum of storage space.
- Work documents can be linked to inspection reports.
- Any information may be printed out.
- Forms can be printed out and filled in manually or the data can be filled in on the computer, even with electronic signatures, if desired. Or the forms can be manually completed and signed and then scanned into the file.
- Information could be made available to other activities if desired.

The activity is continuing to perfect their system but it is already proving its usefulness.

POWER FACTOR

An important aspect in determining the adequacy of a power distribution system is the power factor of the load(s) being supplied. The power factor is defined as the ratio of total Watts to Volt-Amperes. Volt-Amperes is also referred to as apparent power. It is obtained by summing the real and reactive components in quadrature.

Electrical power is comprised of real and reactive components. The real, or active, component is measured in Watts and provides the power for the performance of useful work. The reactive component, measured in Volt-Amperes reactive, results from inductive or capacitive components of a circuit affecting the synchronization of current and voltage in it. Reactive power does not contribute to the performance of useful work.

Although reactive power does not contribute to the performance of useful work, it does flow through the electrical distribution system adversely affecting the sizing of equipment and conductors and inducing additional losses that cause excessive heat to be generated.

What has been discussed above is more specifically considered displacement power factor. Harmonic distortion also influences apparent and reactive power. When power at frequencies other than the fundamental frequency is used, distortion power factor is calculated. When power at the fundamental frequency and its harmonics is used, total or true power factor is calculated.

Here is how the adequacy of a power distribution system is affected by power factor. Consider a 10 kW load. If its power factor is high, say 0.8, the apparent power would be 12.5 kVA. If its power factor is relatively low, say 0.45, the apparent power would be 22.2 kVA. These examples demonstrate how reactive power adversely affects the sizing of conductors and transformers and other equipment in a power distribution system.

Of particular concern, would be electronic adjustable voltage control electric drives utilizing SCR's to power DC motors on cranes. Power factor will be lowest when the motor is operating at slow speed or initially during acceleration or deceleration of the motor. Power factor will be highest when the motor is running at its base speed.

It has been found that the power factor can be initially as low as 0.3 during acceleration of large hoist motors on container cranes. Going back to the above example, the apparent power would be 33.3 kVA. Although of only relatively short duration each time it occurs, this kVA demand can have disruptive effects on a power distribution system and the other loads it supplies by affecting voltage.

Power factor can be improved and harmonic distortions reduced through the use of passive or active devices. These devices use capacitors to synchronize the voltage and current in a distribution system by providing the reactive current at the load so that it is not drawn through the distribution system. Equipment that monitors distribution system conditions and adjusts for changes is the most appropriate for crane applications. 

CRANE SAFETY ADVISORIES AND EQUIPMENT DEFICIENCY MEMORANDA

We receive reports of equipment deficiencies, component failures, crane accidents, and other potentially unsafe conditions and practices. When applicable to other activities, we issue a Crane Safety Advisory (CSA) or an Equipment Deficiency Memorandum (EDM). A CSA is a directive and often requires feedback from the activities receiving the advisory. An EDM is provided for information and can include deficiencies to non-load bearing or non-load controlling parts. Two CSA's and two EDM's, issued as naval messages, are reported since the September 2000 *Crane Corner* and are summarized below:

CRANE SAFETY ADVISORIES

CSA-95: Defective Key-Operated Rotary Selector Switches. This CSA passed on an alert from the equipment manufacturer, Cutler-Hammer, of a defect in some of their E22YD31 key-operated rotary selector switches. The alert is only applicable to Westmont 60-ton portal cranes.

Cutler-Hammer's E22YD31 key-operated rotary selector switches have three-position spring return-to-center key operators. It has been discovered that some of the E22YD31 rotary selector switches will remain in an operating (off-center) position. The subject switches were manufactured and shipped by Cutler-Hammer between January 1995 and December 1999. The subject switch is used on Westmont 60-ton portal cranes.

Within 120 days, install replacement switches for these devices. Cutler-Hammer will replace the subject switches at no charge. Follow the requirements of NAVFAC P-307, paragraph 3.4.3.

Cranes may remain in service pending actions above. Follow NAVFAC P-307, paragraph 10.2.2.3 for controlling the keys on these devices.

CSA-96: Operation of Boom Hoist Pawls. A recent crane accident occurred on a 1943 Wellman portal crane when the boom hoist pawl engaged the wire rope drum ratchet while the boom was being lowered with no hook load. The impact broke and bent the fasteners securing one of the pillow blocks supporting the wire rope drum. The pillow block lifted off and rotated approximately 30 degrees from its support foundation. The pawl remained engaged and prevented the boom from uncontrolled lowering. The crane was originally designed with a manual pawl. The crane manufacturer installed an electric coil to engage and disengage the pawl in the 1980's. The electric coil when energized, holds the pawl disengaged. When the coil is de-energized, the pawl engages the boom hoist wire rope drum ratchet by gravity. Loss of power to the coil will result in pawl engagement. There is no interlock or other means to prevent engagement of the pawl through inadvertent de-energization by the operator or through loss of power to the coil. An interlock is present to prevent boom hoist lowering when the pawl is in the engaged position. However, if the boom is lowering and the pawl moves to engage the ratchet the drive may not be stopped by the time pawl contacts the ratchet.

Within 30 days of issuance of this CSA perform the following for cranes equipped with boom hoist pawls:

- Check to see if the pawl will engage the ratchet if the force or energy holding the pawl in the disengaged position is lost. Most pawl mechanisms are designed such that the pawl remains in the engaged or disengaged position until a force is applied to shift the position of the pawl. Investigate manually operated pawls to see if failure of the operating linkage would result in the pawl engaging the ratchet. Contact the Navy Crane Center if any cranes are found with these operating characteristics.
- Identify any cranes with boom pawls that are engaged and disengaged via electrical, pneumatic, or hydraulic means that do not have an interlock to prevent boom hoist lowering when the pawl is in the engaged position and/or to prevent the pawl from engaging during boom hoist lowering. Contact the Navy Crane Center if any cranes are found that do not have these interlock features.

Mobile cranes are exempt from this crane safety advisory.

EDM-45: Improperly Grounded Water Temperature Sender Units on Diesel Engines on Cranes. Erratic readings were observed on water temperature gauges on diesel engines on several 60-ton portal cranes. (This situation could exist on any crane with a diesel engine.)

For proper operation of a single wire temperature inlet sender, the sender body must be in solid contact with a good ground such as the engine block or chassis. Poor grounding on this and other senders is usually attributed to the use of Teflon tape or pipe compound on the threads or a rubber hose between the engine and the pipe where the water temperature inlet sender may be attached. As a result, the coolant itself is the only return path available for grounding the sender, resulting in erratic readings on the water temperature gauges.

The root cause of this deficiency is poor temperature sender installation. Temperature sender manufacturer instructions stress that a good ground is necessary for accurate operation of the gauges/senders. The condition on the above 60-ton portal cranes went unnoticed since the temperature sender was not associated with any control/alarm/shutdown function and the inlet temperature typically hovered near the extreme left hand range of the gauge (i.e., 100 degrees Fahrenheit) during operation.

EDM-46: Improper Orientation of Wedge Sockets at the Boom Head on Mobile Cranes. Recently, two contractor crane accidents occurred due to improper orientation of wedge sockets.

Some mobile cranes require the wedge socket at the wire rope termination at the boom be oriented in a particular manner. For example, some Grove hydraulic cranes require that the wedge socket be installed with the flat edge toward the boom. If the wedge socket is installed with the wire rope dead-end toward the boom on these cranes, the wedge socket can hit the boom when the boom is raised to the minimum radius. On some link belt hydraulic cranes, when attaching the socket to the boom head, the flat edge of the socket must be installed facing away from the boom. If the wedge socket is installed with the wire rope dead-end away from the boom on these cranes, structural damage to the boom head may occur when the boom is lowered to maximum radius.

The proper installation of the wedge socket at the boom head may vary from one manufacturer to another, and from model to model. Be sure to check the operations manual for each crane you are using or inspecting. ■